Revised
Trends Analysis Plan
For the Coastal Mississippi
Environmental Impact Statement

Prepared by

US Army Corps of Engineers
Mobile District

with Technical Assistance from

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SECTION 1.0: INTRODUCTION

This document outlines the technical approach for conducting a trends analysis in support of the Environmental Impact Statement (EIS) for Large-Scale Development in Coastal Mississippi. Trends analysis is an analytical technique for assessing the status of a resource, ecosystem, and/or human community over time, and it usually results in a graphical projection of past or future conditions. The Council on Environmental Quality (CEQ) recognizes trends analysis as one of the primary techniques for analyzing cumulative effects, as identified in CEQ's handbook *Considering Cumulative Effects Under the National Environmental Policy Act*. Thus, the term *trends analysis*, used in the context of this EIS project, defines an analytical approach that will be used to assess past and future conditions of resources for all alternatives and scenarios evaluated in the EIS.

The trends analysis is a critical component of the special-purpose methodology being evaluated as part of the proposed action (as described in Chapter 2 of the Description of the Proposed Action and Alternatives [DOPAA]). The trends analysis will evaluate regional cumulative effects associated with historical (1992 to the present) and potential future growth (present to 2000) in the region. Using these results, it will be possible to develop and evaluate mitigation strategies to reduce regional cumulative effects (referred to as regional conservation practices [RCPs]). Furthermore, the results of the trends analysis will provide a basis for conducting more comprehensive cumulative effects analyses associated with large-scale permit applications. For example, the trends analysis will be used to assist in developing a framework (i.e., guidance on analytical methods, tiering process) that can be followed when analyzing cumulative effects. In addition, the results of the trends analysis may be used directly by permit applicants for documenting regional, long-term cumulative effects.

The results of the trends analysis will be used as the basis for assessing the environmental consequences of each alternative and growth scenario (as discussed in Section 3) evaluated in the EIS. Resource conditions in the year 2000 will serve as baseline conditions for the EIS and will be described in the Affected Environment section. This section also will include some discussion of the temporal changes in these resources since 1992. However, the focus of evaluating historical trends for each resource between 1992 to 2000 will be to assess potential future conditions in the year 2020. Future conditions of each resource simulated in the trends analysis will be compared to current baseline conditions to characterize the environmental consequences of various growth scenarios or alternatives evaluated in the EIS.

The trends analysis will employ several analytical techniques for simulating future conditions in the year 2020, including economic forecast modeling, satellite imagery analysis, GIS analysis, land-use modeling, analysis of historical data, sustainability analysis, resource-specific modeling techniques, and a variety of qualitative techniques. For most resources, the first part of the trends analysis will consist of simulating land cover changes and population levels in the year 2020 within a defined study area under various growth scenarios evaluated in the EIS. Next, the results of the simulated land cover types will be used as input for various resource-specific predictive models in order to characterize resource conditions in 2020. The technical approach used to assess the conditions of each resource is discussed in Section 4.

As previously discussed, the first part of the trends analysis consists of simulating land cover changes and population levels in the year 2020. Given the uncertainty associated with predicting future growth, it is necessary that the EIS evaluate the cumulative effects of several growth scenarios to capture the range of possible outcomes in 2020. To this end, it is proposed that the trends analysis address three growth scenarios that bound possible future outcomes: *slow growth* (relative to historical trends); *status quo* (maintain current growth levels); and *high growth* (relative to historical trends).

After land cover and future population levels have been simulated for each growth scenario, it is necessary to evaluate the condition of each resource evaluated in the EIS for the year 2020. Characterizing the condition of each resource requires many assumptions regarding how future growth is managed along coastal Mississippi. For example, water quality impairments due to pathogens will be influenced not only by changes in land cover and population in the year 2020 but also by the types and effectiveness of RCPs implemented to reduce fecal coliform loadings. RCPs that reduce fecal coliform loadings may include placing restrictions on the location and/or operation of private septic tanks (with enhanced enforcement); increasing the frequency of sewer hookups in residential developments (as opposed to private septic tanks); implementing agricultural best management practices (BMPs) to reduce loadings in the upper portions of the watershed; implementing urban BMPs to reduce stormwater loadings; and implementing enhanced treatment at wastewater treatment plants. The types of RCPs incorporated into the trends analysis are particularly important because such practices might affect the conditions of resources more than the predicted changes in land cover or population under various growth scenarios. It is important to note, however, that it is not within the authority of USACE to require the implementation of certain types of RCPs. Therefore, the extent to which RCPs might be used to protect the environment in the future is uncertain. To address this uncertainty, the trends analysis will consider two conservation scenarios—status quo and smart growth. Under the status quo scenario it is assumed that conservation practices and levels of enforcement will continue as they have in the past. Under the smart growth scenario it is assumed that additional RCPs will be implemented to improve the future condition of resources under the three growth scenarios. Such an analysis will provide local private and public entities with valuable data that could be used to improve environmental conditions under various growth scenarios.

Considering both the growth scenarios and conservation scenarios discussed above, the trends analysis will evaluate six possible permutations:

1. High growth with status quo RCPs
2. High growth with smart growth RCPs
3. Status quo growth with status quo RCPs
4. Status quo growth with smart growth RCPs
5. Slow growth with status quo RCPs
6. Slow growth with smart growth RCPs

The spatial scope of the trends analysis will depend on the resource area being evaluated. For the most part, the resource-specific study areas will include all areas beyond coastal Mississippi that substantially influence, either directly or indirectly, the condition of coastal resources. For example, water quality along coastal Mississippi is influenced not only by activities along the coast, but also (substantially) by activities in the entire watershed of each bay. Thus, the study area for water quality will consist of the major watersheds and subwatersheds that substantially influence water quality along coastal Mississippi as defined in Section 2 (i.e., the watersheds of Bay St. Louis and Biloxi Bay). However, the

Environmental Consequences section of the EIS will still focus on characterizing impacts on resources in the originally defined study area of coastal Mississippi, as defined in Section 2.

Given the inherent complexity of predicting future conditions for complex environmental systems, it was determined that the scope of the trends analysis should focus on finding solutions to regional environmental problems, rather than on conducting exhaustive modeling of future conditions based on uncertain assumptions. Thus, semi-quantitative or qualitative analytical techniques will be used in many cases to characterize the conditions of coastal resources. In general, quantitative techniques will be limited to key resource areas (e.g., water resources, wetlands, socioeconomics) and/or analytical steps (e.g., GIS-based land cover conversion models) that will provide the most meaningful data to support the trends analysis. Furthermore, the scale of the analysis is such that the impacts of individual projects will not be analyzed separately, only the cumulative effects of small and large-scale projects within the study area will be evaluated. Evaluating and documenting the contribution of specific large-scale projects to these regional cumulative effects (from both direct effects and induced development) will be the responsibility of the permit applicant (although guidance for conducting such an analysis based, in part, on the trends analysis will be provided along with the special-purpose methodology). In addition, the scale of the analysis is such that the cumulative impacts of small and large scale projects on any specific location within the region will not be evaluated. Rather, the analysis will evaluate regional impacts, often at a watershed level.

The sections that follow describe the technical approach for conducting the trends analysis.

SECTION 2.0: CONCEPTUAL APPROACH

The conceptual approach for conducting the trends analysis is presented below. Sections 3 and 4 provide more details on the technical approach for simulating land cover changes, population growth, and the conditions of each resource in 2020.

1. Identifying Key Issues. The first step in conducting the trends analysis is to identify the key issues or variables that need to be assessed in order to best characterize the condition of a resource. Important data that were used to identify the key issues for the trends analysis include available studies (e.g., the U.S. Environmental Protection Agency's (USEPA) Surf Your Watershed web site which provides data on the primary pollutants and their sources for watersheds across the United States); site-specific documentation (e.g., Broadwater Draft EIS); professional judgment; and results of interagency and public scoping meetings.

2. Define the Scope of the Trends Analysis. For each key issue identified above, the general scope for the analysis was defined. In general, quantitative techniques were used, where feasible, to assess the most important issues identified through the scoping process (e.g., impacts on water quality and wetlands). Qualitative and semi-quantitative approaches were developed for those issues that were deemed to be of lesser importance by the public and/or interagency participants or for which quantitative techniques were not practical.

3. Study Area. For the purposes of predicting the condition of resources along the coast, it is necessary that the study area include all areas that substantially influence the condition of coastal resources. Thus, it is necessary to establish a specific study area for each resource evaluated in the EIS. For many resource areas, the study area will be defined by the major watersheds and subwatersheds that substantially influence environmental conditions on the coast, including the watersheds of Bay St. Louis and Biloxi Bay, as shown in Figure 2-1. However, the characterization of resources and the environmental consequences analysis will still focus on the coastal study area presented in Figure 2-2 and described below:

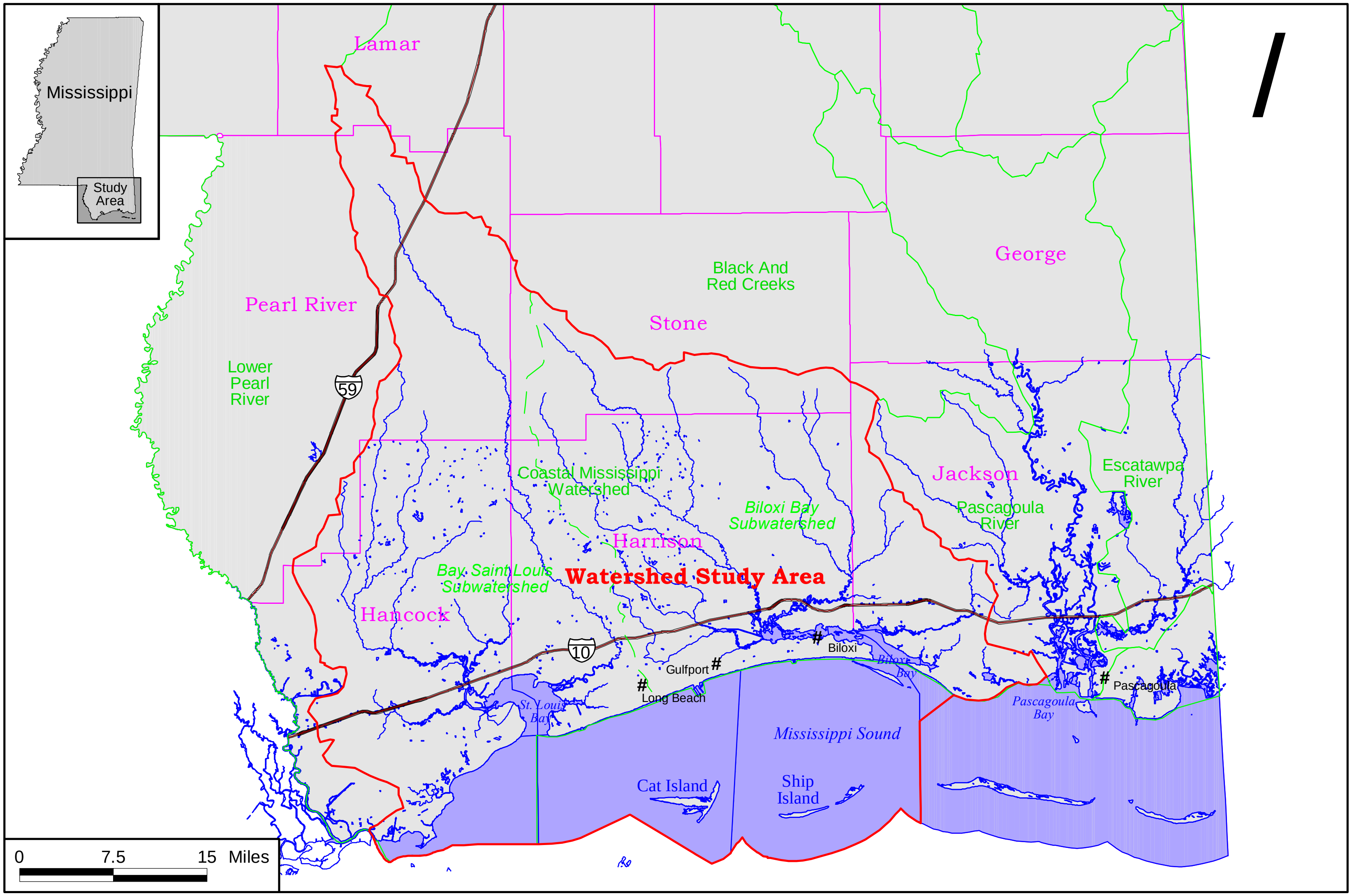
- *Northern Boundary:* 2 miles north of Interstate Highway 10 (with the addition of the proposed Traditions development, which is located approximately 6 miles north of I-10).

- *Southern Boundary:* Mississippi Sound, including Mississippi barrier islands located south of Hancock and Harrison counties.

- *Western Boundary:* Western boundary of the Bay St. Louis subwatershed, located near the Louisiana-Mississippi state border.

- *Eastern Boundary:* Eastern boundary of the Biloxi Bay subwatershed, located approximately 10 miles east of the Jackson-Harrison county border.

4. Select Environmental/Community Indicators. The next step in the trends analysis is to select specific environmental/community-based indicators that can be measured and assessed to evaluate the change in condition of each resource for each of the key issues previously identified. For example, environmental indicators for water quality impairments from pathogens (identified as a key issue)



LEGEND

Watershed Study Area

USGS Hydrologic Unit

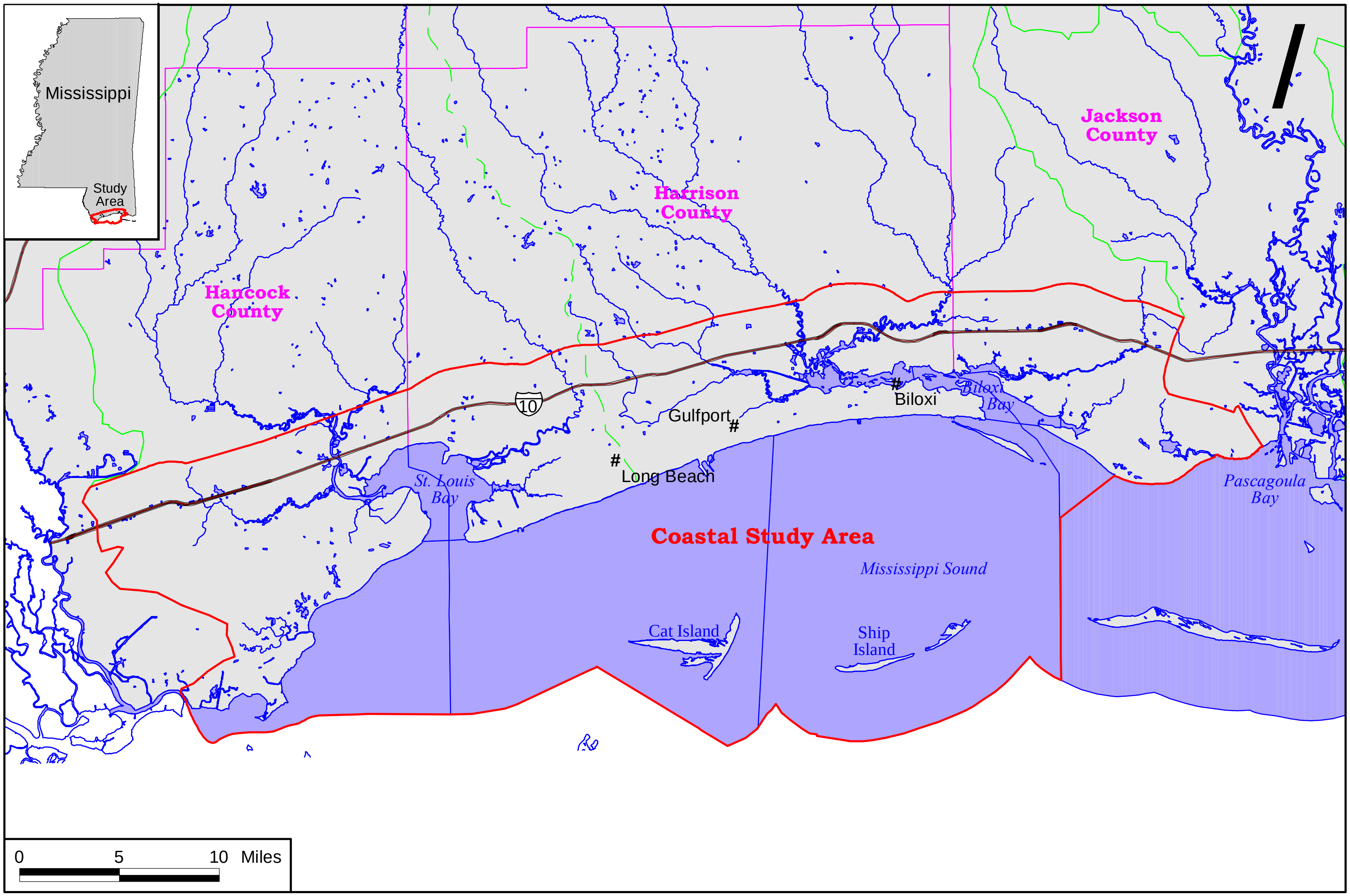
County Boundary

Source: CEI, 2000.

Watershed Study Area

Mississippi Coastal EIS

Figure 2-1



LEGEND

- Coastal Study Area
- USGS Hydrologic Unit
- County Boundary

Source: CEI, 2000.

Coastal Study Area

Mississippi Coastal EIS

Figure 2-2

might include fecal coliform concentrations, fecal coliform loadings, and/or source variables that might be highly correlated to pathogen loadings (e.g., land cover, number of septic tank failures).

5. Assess Historical Trends for Selected Environmental/Community Indicators. For each indicator variable, historical data will be analyzed to assess the presence of any trends for each environmental/community indicator. Based on these trends, an approach for simulating the future conditions of each environmental/community indicator will be refined.

6. Simulate Regional Growth. To simulate future conditions of environmental/community indicators, it is first necessary to simulate regional growth for each growth scenario. Regional growth will be simulated based on an assessment of historical growth patterns (based on an analysis of satellite imagery), GIS analysis, local planning data, planned future large-scale projects, and coastal planning studies conducted by the Mississippi Department of Marine Resources (MSDMR). The principal output of the growth analysis will be the percentage of land cover types and population levels in 2020. The technical approach for simulating future land cover is presented in Section 3.

7. Simulate Environmental/Community-based Indicators in 2020. The final step in the trends analysis is to simulate the conditions of environmental/community-based indicators in 2020 based on the regional growth modeling effort, historical trends analysis, and/or resource-specific predictive models, as discussed in Sections 3.0 and 4.0. For certain resources, the output from the growth simulation analysis (predicted land cover and population levels in 2020) and the results of the historical trends analysis for a specific indicator will be used qualitatively to assess future conditions of a resource. For other resources, the output from the growth simulation analysis will be used as input to the resource-specific models that will be used to simulate future conditions of the selected environmental/community-based indicator in 2020.

SECTION 3.0: TECHNICAL APPROACH FOR SIMULATING LAND COVER CHANGES

The EIS is being prepared to assess the environmental and socioeconomic impacts associated with permitting activities relative to large-scale developments in coastal Mississippi. In addition, the EIS must address the effects of induced development (at all levels) caused by economic growth, primarily resulting from large-scale development projects. To evaluate the impacts from this development, it is required that the trends analysis evaluate the extent and rate of development since 1992, as well as simulate the extent of future development to the year 2020. As previously discussed, the trends analysis will simulate growth for three scenarios: *slow growth, status quo* growth, and *high growth*. For each growth scenario, the percentage of land-use cover types and the population levels will be estimated.

The principal steps for estimating changes in land cover are presented below.

1. ***Establish Baseline Land Cover.*** As previously discussed, the conditions of resources in the year 2000 will be used as baseline conditions in the EIS. Land cover data (in ArcView geographic information system [GIS] format) derived from satellite imagery are available for the year 1992 and 1995/96. Satellite data are available for every year since 1992 for commercial sale; however, these data have not been translated into land use cover types (with the exception of 1995/96). To establish current baseline conditions and assess historical trends, it is imperative that a more recent GIS (ArcView) file of land cover data be created. Currently, MSDMR is engaged in creating a 1999 land cover map which would provide sufficient baseline data for predicting growth. A more recent land cover map also will be useful for assessing the baseline conditions of various resources for the EIS. If for some reason the MSDMR data set for 1999 will not be available in time, it is proposed that a Landsat thematic satellite image, at 30-meter resolution, be obtained for the study area for the year 2000. Using ERDAS imaging software and ArcInfo, the satellite image will be translated into a GIS layer using the NLCD Land Cover Classification System (i.e., the same methods used for the 1992 MSDMR land use data). The relevant land categories used for this classification system are open water, low-intensity residential development, high-intensity residential development, commercial/industrial/transportation development, barren areas (e.g., bare rock, sand, clay, quarries, transitional areas), deciduous forest, evergreen forest, mixed forest, shrubland, non-natural woody areas (e.g., orchards, vineyards), grasslands, pasture, row crops, small grains, fallow, urban/recreational grasses, woody wetlands, and emergent herbaceous wetlands.

2. ***Estimate Land Consumption Rates.*** The next step is to estimate land consumption rates and shifts in land cover over time. Several techniques can be used to conduct this analysis, each with its own strengths and weaknesses. An overview of each technique is presented below.

   Analysis of Remote Sensing Data. Land cover maps from the MSDMR data set for the years 1992, 1995/96, and newly created baseline coverages (either 1999 or 2000) will be compared to assess historical trends in land cover changes and growth patterns. This analysis will be conducted at the watershed level (because most resources will be evaluated at this scale). A GIS analysis will be conducted to estimate the acreage and percent change of each land cover type. These data will be used to derive annual land consumption rates for residential and commercial development in the entire region, as well as for individual watersheds. One of the benefits of using satellite imagery to assess land consumption rates is that it provides a real world assessment of recent growth patterns and land cover changes. A limitation of this approach is that it does not adequately assess the impacts of induced growth and economic changes that might occur in the future.

Assessment of Local Plans. Another approach for forecasting land consumption rates is a detailed assessment of current plans for future development. Through interviews with various planning entities, it will be possible to evaluate changes in land cover due to reasonably foreseeable development projects. With this information, it might be possible to calculate land consumption rates for the near term in specific watersheds. A benefit of this approach is the ability to capture imminent changes in land cover and the ability to assess long-term trends in future development activities. A limitation of this approach is that the land consumption rates are only estimates, might reflect only very localized situations, and might not adequately capture regional development trends. Furthermore, the estimates are based on near-term projects and may not adequately assess the extent of induced development in the long term.

MSDMR Simulations. MSDMR has conducted studies directed by the Coastal Resource Urban Planning effort to assess population and land cover changes along the coast of Mississippi. Through these efforts MSDMR has projected land-use changes and population increases to 2020 to the census block level. The methods used by MSDMR will be evaluated and the results compared to land consumption rates derived by other methods. If it appears that the MSDMR simulations produced reasonable results for the purposes of this EIS, those results will be used as the basis for assessing shifts in population and land cover. Alternatively, the results of the MSDMR simulations could be used in conjunction with other simulation techniques discussed in this section to develop reasonable land consumption rates for each growth scenario.

Socioeconomic Forecasts. A sophisticated socioeconomic forecasting model developed by Regional Economic Modeling Incorporated (REMI; the software also is referred to as REMI) will be used to predict long-term economic growth in terms of revenue and numbers of employees for more than 50 Standard Industrial Codes (SICs). In addition, the REMI model will be used to predict local residential population levels. From these results, economic growth indicators will be selected that are highly correlated with land cover changes realized from 1992 to 2000. A trends analysis will be conducted using these data to evaluate the adequacy of land consumption rates derived using remote sensing, local planning data, and MSDMR projections. In the event that these methods do not appear to adequately capture induced long-term development, the economic data projected for 2020 will be used directly, or in part, to derive land consumption rates for commercial, industrial, and residential purposes. To derive land consumption rates for commercial and industrial land use, the estimated increase in the number of employees in the year 2020 will be multiplied by estimated square footage requirements per employee (for particular business categories). To derive land consumption rates for residential land use, the increase in number of residents in the year 2020 will be multiplied by the acreage needs per resident.

3. ***Define Growth Scenarios.*** As previously discussed, three growth scenarios will be evaluated in the trends analysis: *slow growth, status quo*, and *high growth*. The *status quo* scenario will evaluate the most likely future growth projections based on the land consumption estimates derived in Step 2 above. The *status quo* scenario will include those projects that have been permitted but not constructed, as well as planned projects that might be permitted in the future. The *slow growth* scenario will evaluate a reduced level of urban development (relative to current conditions) based, in part, on a reduction in the number of future large-scale projects (i.e., reduction in large-scale permit applications and/or approved permits). The *slow growth* scenario will include large-scale projects

that have received permit approval but have not been constructed, as well as a limited number of future large-scale projects. The *high growth* scenario will evaluate a higher level of urban development (relative to current conditions) based, in part, on a higher number of future large-scale projects (i.e., increase in large-scale permit applications and approvals). The *high growth* scenario will include those projects that have been permitted but not constructed, as well as planned projects that might be permitted in the future. In addition, all the scenarios listed above will include the effects of induced long-term growth associated with small- and large-scale development projects already in place.

Land consumption rates will be established for each growth scenario based on the results of a sensitivity analysis. For the *status quo* scenario, the range of most likely future growth projections derived using each of the methods described in Step 2 will be assessed. If the MSDMR projections appear reasonable, these estimates will be used for the *status quo* scenario. Otherwise, some combination of these estimates might be used (e.g., an average). For the *high growth* scenario, the REMI model will be used to evaluate the effect of significantly increasing the economic output of certain sectors of the economy, due in part to an assumed increase in large-scale permitting activity. These results will be used to estimate the percent increase in economic activity and population growth in 2020 as compared to the status quo scenario in 2020. The results, along with the results of other sensitivity analyses (using remote sensing, local planning data, and MSDMR simulations), will be used to establish a reasonable upper-bound land consumption rate for the *high growth* scenario. For the *slow growth* scenario, the REMI model will be used to evaluate the effect of significantly reducing the economic output of certain sectors of the economy, due in part to an assumed decrease in permitting activity. These results will be used to estimate the percent reduction in economic activity and population growth in 2020, as compared to the *status quo* scenario in 2020. The results, along with the results of other sensitivity analyses, will be used to establish a reasonable lower-bound land consumption rate for the *slow growth* scenario.

Based on the land consumption rates derived above, annual average permitting rates will be characterized for each of the growth scenarios. Permitting rates can be expressed as an average number of permits issued per year, average total acres developed for permitted projects per year, and/or average total investment value of construction projects per year, either for large permits only or for all permits combined. Relating growth scenarios to assumed USACE permitting activities will assist in characterizing the cumulative effects associated with large-scale permitting activities. For the *status quo* scenario, the permitting rates will reflect historical trends. For the *high growth* scenario and *low growth* scenario, the permitting rates used in the REMI analysis to establish land consumption rates for these scenarios will be used.

4. ***Simulate Growth.*** The final step in this process is simulating the percentage of land cover types in each study area (e.g., for individual subwatersheds) in the year 2020. These percentages will be derived using GIS, baseline land coverages (for the year 2000), historical growth trends, and the land consumption rates derived in Step 3. It is the objective of this analysis not to project the actual location of specific land cover types in 2020, but only to assess the percent change in land cover types in a watershed (or other defined boundary, as needed for a given resource). These percentages will provide sufficient data for the purpose of conducting loadings modeling or assessing impacts on specific resources. For example, to assess impacts on wetlands, a trends analysis will relate historical wetlands loss with historical urban growth data (1992 to 2000). Using projected changes in land cover types in the year 2020 and historical wetlands loss data, the acreage of future

wetlands loss will be estimated for the entire watershed (without the need to simulate specifically where the wetlands will be lost or where urban growth will be located).

For conservation purposes, a GIS analysis will be conducted to map out where future development could occur in the watersheds without having a significant impact on the environment. This analysis will be useful for planners to show how various levels of growth could be sustained while impacts on wetlands, water resources, and other resources are minimized.

SECTION 4.0: TECHNICAL APPROACH FOR SIMULATING CONDITIONS OF COASTAL RESOURCES IN 2020

This section presents an overview of the technical approach for conducting the trends analysis for specific resources to be evaluated in the EIS. Although the EIS will address all relevant resources that might be affected by Corps permitting decisions, detailed quantitative analyses will be conducted for only the issues that are most important to the stakeholders and the public or from a scientific perspective. Of all the resources evaluated, the stakeholders have identified water-related issues (particularly water quality degradation from pathogens and sedimentation) and loss of wetlands as the primary issues to be evaluated. Other issues identified during public and interagency scoping will be addressed either quantitatively (if data are readily available), semi-quantitatively, or in most cases qualitatively in the trends analysis. The technical approaches proposed for each resource area evaluated in the EIS are presented below. It should be noted that much of the baseline data used to assess the current condition of coastal resources in the study area will be obtained from the MSDMR GIS developed as part of the Coastal Resource Management Planning effort.

4.1 GEOLOGY AND SOILS

- *Issues:* Soil erosion and development in hydric soils.

- *Scope of the Analysis:* Interagency participants and attendees of the scoping meeting indicated that soil erosion and development in hydric soils were issues of concern. The primary sources of soil erosion include agricultural lands and land preparation and construction activities for new development. Given that soil erosion also is an important issue relative to water quality, soil loss and loadings will be evaluated semi-quantitatively in the trends analysis. This analysis also will be useful to assess the relative contribution of various sources to sedimentation in the study area. Best management practices, as recommended by the Mississippi Department of Environmental Quality in its 1994 *Mississippi Planning and Design Manual for the Control of Erosion, Sediment, and Stormwater* and the *Mississippi Storm Water Pollution Prevention Plan (SWPPP) Guidance Manual for Construction Activities* will be used to assess RCPs to be applied during construction to minimize soil erosion.

  Development in areas with hydric soils, particularly placement of septic tanks in soils that do not drain properly, is an important issue identified during scoping. Although the centralized wastewater systems are expanding in the three counties, about half of the households still rely on septic systems. The trends analysis will semi-quantitatively evaluate the trends relative to increases in residential development, placement of septic tanks in areas with hydric soils, and tank failure rates.

- *Study Area:* Subwatersheds of Bay St. Louis and Biloxi Bay.

- *Analytical Approach:*

  Soil Erosion:

  - Review soil surveys, maps, and previous studies provided by MSDMR and others to determine characteristics of soil (e.g., highly erodible, acidic) in the study area.

- Estimate land use cover types based on 1992 MSDMR data and 2000 satellite imagery (particularly agriculture and barren cover types) and simulate changes in the percent of land use cover types within the study area to the year 2020 under different growth scenarios. These data will be used to evaluate the potential for soil erosion due to construction of new residential, commercial, and industrial facilities and associated infrastructure.

- Estimate soil loss under past and current baseline conditions to assess historical trends. Evaluate available anecdotal information on sedimentation problems in the study area.

- Review state of Mississippi guidance manuals for construction best management practices.

- Estimate potential soil loss and loadings for watersheds and subwatersheds for each growth scenario and conservation scenario evaluated in the trends analysis for the year 2020. Use soil loss and loadings estimates as an environmental indicator variable for characterizing and comparing the condition of geology/soils resources in 2020.

Hydric Soils:

- Review soil surveys provided by MSDMR and other previous studies to determine the location of hydric soils in the study area.

- Use census data and information from the county health departments, compiled by MSDMR, to estimate the percent of households on septic systems as opposed to centralized wastewater systems, where these households are located, and where centralized wastewater systems are planned to be expanded.

- Evaluate historical trends in septic tank installation (relative to hydric soils and location near water bodies), operation and maintenance practices, and failure rates.

- Estimate the growth in septic system use based on projected expansion of residential households in 2020 under various growth scenarios. Use historical trends data and projected land cover data to predict future impacts on hydric soils. Water quality and aquatic biological issues evaluated in other sections below.

4.2 HYDROGEOLOGY

- *Issues:* Reduction in groundwater table and groundwater quality.

- *Scope of the Analysis:* Interagency participants and attendees of the scoping meeting indicated that reduction in the groundwater table due to increased economic growth is the primary area of concern for hydrogeologic resources. According to a January 2000 study, regional water level declines have averaged less than 2 feet per year, but attendees of the scoping meeting reported declines of 5 feet per year. Groundwater use will be evaluated semi-quantitatively in the trends analysis.

  Drawdowns in the groundwater table can affect water quality. Large water withdrawals in the study area have resulted in the movement of saltwater toward wells; this movement of saltwater produces an increase in the chloride content of water supplies. Historical data will be evaluated to qualitatively assess the groundwater quality and the risk of saltwater intrusion into freshwater aquifers.

- *Study Area:* Primarily the coastal study area, as defined in Section 2.

- Analytical Approach:

  Groundwater table:

  - Gather data on groundwater use between 1992 and 2000, and on aquifer recharge rates.

  - Correlate groundwater withdrawals to population, and correlate water table fluctuations with recharge rates. Use projected population levels in the year 2020 to assess future groundwater withdrawals for each growth scenario. Use projected groundwater demands to assess the condition of groundwater levels in the year 2020.

  - Research other studies to estimate available groundwater supply and compare with projected groundwater use. Groundwater needs and alternative freshwater sources are addressed in the *Infrastructure* section below.

  Groundwater quality:

  - Research available historical data on the rate of saltwater intrusion. Qualitatively assess risk of impairment to groundwater quality from drawdown of water table.

4.3 COASTAL PROCESSES

- *Issues:* Reduced circulation, increased residence time, reduced wave action, and beach modification.

- *Scope of the Analysis:* Quantitative analysis of coastal processes (e.g., circulation modeling, wave modeling) requires intensive site-specific modeling techniques and project-specific assumptions which are best addressed in site-specific documents. Therefore, coastal issues will be addressed qualitatively in the EIS.

- *Study Area:* Coastal study area as defined in Section 2.

- *Analytical Approach:* As previously discussed, no circulation modeling or wave modeling is anticipated given the site-specific nature of this effort. Impacts on coastal processes in the year 2020 will be discussed qualitatively based on an evaluation of historical trends data.

4.4 HYDROLOGY

- *Issues:* Increased flooding, sedimentation, and dredging.

- *Scope of the Analysis:* Scoping meeting participants identified coastal flooding as an area of particular concern. Loss of wetlands and increases in impervious surface might increase the likelihood of coastal flooding and changes to the floodplain along streams and rivers. Other concerns raised during scoping included sedimentation and dredging impacts on several resources (e.g., water quality, aquatic habitat, hydrology). Dredging for coastal development and navigation projects can significantly alter the depths and morphology of a water body. Furthermore, long-term impacts of sedimentation can alter the morphology of rivers, streams, lakes, and other water bodies to the point where the function of the waterbody is impaired.

Hydrology impacts can be highly site-specific and generally require modeling efforts that include significant site-specific data on specific water bodies. Thus, hydrology will be evaluated qualitatively in the trends analysis. A screening model may be used to assess the relative potential for increased flooding due to wetlands losses.

- *Study Area:* Subwatersheds of Bay St. Louis and Biloxi Bay.

- *Analytical Approach:*

  - Quantitatively evaluate wetlands loss and increases in impervious surface with the subwatersheds.

  - Analyze historical trends information related to flooding, sedimentation, and dredging.

  - Estimate relative land use cover types in the watersheds of Bay St. Louis and Biloxi Bay based on 1992 MSDMR data and 2000 satellite imagery. Evaluate changes in impervious surface and wetlands loss and evaluate any historical trends data relative to flooding and sedimentation.

  - Simulate changes in the percent cover of land use types in each watershed to the year 2020 based on different growth scenarios. Assess the change in impervious surface and wetlands loss for each growth scenario in 2020. Use a screening model to assess the relative potential increase in flooding due to wetlands losses. Qualitatively evaluate the benefits of regional conservation practices, such as wetlands construction for retention and treatment of urban storm water runoff.

  - Use the results of the screening model and/or historical trends analysis to qualitatively assess the potential for flooding for different growth scenarios and conservation scenarios evaluated in the trends analysis.

4.5 WATER RESOURCES

4.5.1 Surface Water

- *Issues:* Pathogens, heavy metals, organics, dissolved oxygen (DO), total suspended solids (TSS), and salinity.

- *Scope of the Analysis:* Interagency participants indicated that pathogens and sedimentation were the primary water resource problems along the coast. Primary sources for pathogens include septic tank failures (direct discharge and runoff), wastewater treatment plant discharges, urban storm water, agricultural runoff (crop and grazing), and the natural environment. Soil erosion from commercial development and agricultural runoff is the primary source of sedimentation (evaluated in detail under *Sediment* below). Comments received during interagency and public scoping meetings indicated that a watershed-level approach should be used to address these water quality issues along the coast. Thus, it was determined that the trends analysis would focus on evaluating these specific water quality issues (pathogens and sedimentation) semi-quantitatively at a watershed level. These watersheds extend well beyond the original study area boundary and well north of the three county area. Given that water quality problems have already been identified within the region, future degradation of water quality can be adequately assessed qualitatively without the need for detailed water quality modeling (modeling that estimates specific fecal coliform concentrations in specific water bodies, which would also be too costly). Rather, it was determined that project resources should be expended primarily to evaluate relative loadings and source control measures in order to find solutions to the water quality problems of the Mississippi coastal area. To this end, the EIS will quantitatively evaluate the relative contribution of sources (through loadings modeling at the watershed level) and the potential benefits of implementing RCPs under different future growth scenarios. The trends analysis also will include a semi-quantitative analysis of water quality conditions under future growth scenarios based on the results of the loadings modeling.

Other water quality issues, such as heavy metals, organics, DO, and salinity, will be evaluated qualitatively in the EIS. Predictive water quality or loadings modeling will not be conducted for these parameters.

- *Study Area:* Subwatersheds of Bay St. Louis and Biloxi Bay.

- *Analytical Approach:*

Pathogens:

➢ Use existing studies and monitoring data to evaluate the spatial and temporal extent of pathogen problems from 1992 to the present.

➢ Estimate relative land use cover types in the watersheds of Bay St. Louis and Biloxi Bay based on 1992 MSDMR data and 2000 satellite imagery.

➢ Estimate point and nonpoint source loadings in order to evaluate relative contribution of fecal coliform bacteria counts in the selected watersheds from the natural environment, croplands, pasturelands, septic tanks (direct discharge and runoff), wastewater treatment plants, and urban runoff for the year 2000. Based on these results, develop cost-effective RCPs that can be used to reduce fecal coliform loadings in the future.

➢ Simulate changes in the percent land cover in each watershed to the year 2020 under different growth scenarios. Estimate changes in fecal coliform loadings based on changes in land cover types for different growth scenarios. For each growth scenario, evaluate the benefits of various source control strategies. Semi-quantitatively evaluate overall water quality changes based on the results of the loadings analysis.

Other Water Quality Parameters:

➢ Use existing studies and monitoring data (e.g., USEPA's STORET database) to evaluate the spatial and temporal extent of other water quality problems, particular heavy metals, turbidity, DO, and salinity fluctuations.

➢ Simulate changes in land cover in the watersheds to the year 2020 under different growth scenarios. Qualitatively evaluate potential future water quality impacts and the potential benefits of implementing RCPs by evaluating changes in selected environmental indicator variables (e.g., impervious surface, barren ground cover, sediment loadings, wetlands loss, pathogen loadings).

4.5.2 Sediments

- *Issues:* Sedimentation (deposition and composition) and sediment toxicity (heavy metals, organics).

- *Scope of the Analysis:* Interagency participants identified sedimentation as one of the primary water resource problems along the coast. Runoff from ongoing construction projects and agricultural lands may be the primary source of sedimentation. Although sedimentation is a regional issue, the impacts of sedimentation can be highly site-specific, localized, and temporary. Instead of quantifying sediment deposition rates, which might be difficult to model, it was determined to evaluate changes in land cover or soil loadings that contribute significantly to sedimentation. The trends analysis will evaluate changes in the percentage of various land covers that contribute to sedimentation (particularly bare ground and agricultural land) between the years 2000 and 2020 for each development scenario. In addition, the relative percent contribution of each land cover to regional sedimentation problems will be analyzed. An estimate of soil loadings will be derived using literature soil loss values for different land cover types. Based on these results, cost-effective RCPs will be evaluated.

  Other sediment resource issues, such as increased toxicity (heavy metals, organics) and changes in sediment particle size, will be evaluated qualitatively in the EIS.

- *Study Area:* Subwatersheds of Bay St. Louis and Biloxi Bay.

- *Analytical Approach:*

  Sedimentation:

  - Use existing studies and monitoring data to qualitatively evaluate the spatial and temporal extent of sedimentation problems from 1992 to the present (with respect to both sedimentation deposition and particle size composition).

  - Estimate the percent change in land cover types (particularly bare ground and agricultural lands) in the subwatersheds of Bay St. Louis and Biloxi Bay based on 1992 MSDMR data and 2000 satellite imagery.

  - Estimate soil loss and sedimentation in each subwatershed for each land use cover type and compare the relative contribution of each to sedimentation problems in the region. Based on these results, develop cost-effective RCPs that can be used to reduce sedimentation loads.

  - Simulate percent changes in land cover in each watershed to the year 2020 under different growth scenarios. Semi-quantitatively estimate changes in sedimentation loadings based on changes in land cover types for different growth scenarios. For each growth scenario, evaluate the benefits of implementing RCPs. Qualitatively evaluate overall sedimentation changes based on the results of the land cover analysis.

  Sediment Quality:

  - Use existing studies and monitoring data, particularly the results of USEPA's National Sediment Inventory, to evaluate the spatial and temporal extent of sediment toxicity problems in the watersheds of Bay St. Louis and Biloxi Bay.

- Simulate changes in land cover types in each watershed to the year 2020 for different growth scenarios. Qualitatively evaluate potential future impacts (based on past trends and/or projected land cover types) and the potential benefits of implementing RCPs.

4.6 BIOLOGICAL RESOURCES

4.6.1 Aquatic Resources

- *Issues:* Loss of aquatic plant beds or areal coverage; reductions in commercial and recreational fish populations; reductions in populations of commercially important invertebrates; loss of essential fish habitat (EFH); water quality changes (salinity) and drainage impacts on fisheries; impact of boating on fish; and protection of fisheries.

- *Scope of the Analysis:* Comments received with respect to aquatic resources focused on impacts on fisheries. The trend analysis, therefore, will focus on those factors that directly and indirectly affect fisheries. The factors include direct takings of fish habitat, direct takings of habitats of commercially important invertebrates, and indirect impacts on these habitats. Direct impacts will be determined qualitatively (based on changes in wetlands losses, and fish catch and fish population indices).

- *Study Area:* Coastal study area as defined in Section 2 (although indirect impacts of trends in the subwatersheds of Bay St. Louis and Biloxi Bay also will be evaluated).

- *Analytical Approach:*

  - Qualitatively estimate potential direct impacts on EFH under each growth scenario based on estimates of wetland losses at the subwatershed level (see *Wetlands* section) and available information on essential fish (and invertebrate) habitat for spawning and other life cycle needs.

  - Qualitative losses to fisheries will be described within the context of estimated environmental impairments and other factors that may contribute to declines in fisheries, such as overfishing. The National Oceanic and Atmospheric Administration (NOAA) and the State of Mississippi will be contacted for the information necessary for this effort.

4.6.2 WETLANDS

- *Issues:* Direct and indirect loss of wetlands and wetland system function.

- *Scope of the Analysis:* Participants in the scoping process indicated that their primary concerns with respect to wetlands were direct losses of wetlands from development; indirect losses due to siltation, changes in drainage systems and patterns, and salinity changes; and the success, failure, or lack of adequate wetland loss mitigation efforts. Additionally, concerns were raised about the loss of functioning wetlands in a wetland system due to the removal of a critical quantity of wetlands in the system or alterations to the functioning of a wetland system by means of drainage changes, siltation, and so forth. These changes would affect surrounding wetlands in the system, yielding an overall degradation of wetland function.

  Direct loss of wetlands habitat will be evaluated in the trends analysis quantitatively using remote sensing and simulated land cover changes in subwatersheds. Indirect loss of wetlands habitat due to siltation and other habitat modifications will be evaluated qualitatively using the results of the sediment loadings analysis. Loss of wetland system function due to overall reduction in wetlands habitat is more difficult to estimate. Functional value assessments of wetlands in coastal Mississippi do not appear to be available. Therefore, impacts on wetlands function will be evaluated qualitatively. To the extent possible, studies of wetlands function in areas near the study area will be used to assign functional values to wetlands in coastal Mississippi. Using these data, impacts on wetland system function due to reductions in wetland habitat types (e.g., loss of high-value wetlands) will be evaluated.

- *Study Area:* Subwatersheds of Bay St. Louis and Biloxi Bay.

- Analytical Approach:

Direct Wetlands Loss:

- Quantitatively estimate historic wetlands loss based on satellite imagery (comparing 1992 with baseline conditions in 2000) and other sources of historic land use information, as available. Using the GIS wetlands layers, divide this loss by wetland type and subwatershed.

- Estimate relationship between historic urban growth and wetlands loss in the study area.

- Estimate change in land cover types in 2020 for each growth scenario.

- Estimate quantitatively the loss of wetlands through 2020 based on historical loss patterns, future growth scenarios, and implementation of RCPs.

Indirect Wetlands Loss:

- Use related studies of sedimentation, salinity changes, and groundwater withdrawals to qualitatively characterize indirect impacts on wetland systems at a subwatershed level.

- Qualitatively describe potential losses of wetlands due to filling (by siltation) and groundwater level reductions on a watershed level.

Loss of Wetland System Functional Value:

- Qualitatively describe the functional value of existing wetland systems in the study area, based on data available for wetlands in the area or, if such data are not available, on data for similar wetlands in the coastal Gulf of Mexico region. If the functional values of the wetland systems in the study area are not available, a general description of the functional values associated with the types of wetlands present in the study area will be provided. Functional values will be based on hydrogeomorphic characteristics, as described in Brinson (1993), Shafer and Yozzo (1998), and Brinson et al. (1995). If appropriate, functional values will be assigned to wetland types by associating functional values applied to similar wetlands in the Gulf Coast region. These data will be added to the existing wetlands GIS coverage available for the Mississippi coastal area.

- Generally describe potential impacts on wetland system functioning based on the estimates of the quantity of specific wetland types that may be lost in the future under various growth scenarios and conservation scenarios evaluated in the trends analysis.

4.6.3 Terrestrial Resources

- *Issues:* Loss of terrestrial habitat, habitat fragmentation, population-level impacts on terrestrial species (particularly rare and listed species), and biodiversity.

- *Scope of the Analysis:* Comments on terrestrial resources focused on loss of terrestrial habitat and indirectly by fragmentation or encroachment. The scope of the analysis and technical approach for evaluating impacts on terrestrial resources will be similar to that outlined for wetlands. A quantitative analysis of historical and current land coverages will be performed, and quantitative estimates of potential losses due to development will be derived from the historical data and the growth simulation analyses. Impacts on terrestrial wildlife, particularly state-listed species and overall biodiversity, will be assessed qualitatively based on the results of the quantitative habitat analysis and available studies.

- *Study Area:* Coastal study area as defined in Section 2.

- *Analytical Approach:*

  - Determine existing coverages of terrestrial resources by land cover type in the study area using GIS and satellite imagery. Identify potential sensitive habitat areas, including areas with known occurrences of rare, threatened, and endangered species.

  - Determine historical loss rates of terrestrial habitat types from 1992 to 2000. Evaluate various case studies that resulted in controversial losses in sensitive/high-value habitat, encroachment, and/or habitat fragmentation between 1992 to 2000. Using projected land cover types in 2020 and the historical loss rates, estimate the future loss of terrestrial habitat in the coastal study area.

  - Compare the morphology and connectiveness of terrestrial habitat in 1992 and 2000. Projected land cover types in the year 2020 and historic changes in encroachment and fragmentation will be used to predict the extent of future fragmentation and encroachment impacts for each scenario.

  - Use habitat analysis and available studies to qualitatively assess impacts on terrestrial wildlife, with an emphasis on state-listed species (federally-listed species are discussed below) and overall biodiversity. Conservation strategies (e.g., buffer zones to protect sensitive habitat, establishing corridors, development configurations to reduce fragmentation and encroachment) will be assessed and the potential benefits from implementation will be evaluated qualitatively in the trends analysis.

4.6.4 Threatened and Endangered Species

- *Issues:* Direct and indirect impacts on threatened and endangered species.

- *Scope of the Analysis:* Federally listed threatened and endangered species (TES) were mentioned during the scoping meetings, but only a small number of comments were received. Nevertheless, TES issues are very important because of the legal mandate to protect them. TES (including candidate species) confirmed to be in the study area include Alabama red-bellied turtle, Kemp's ridley sea turtle, bald eagle, Eastern indigo snake, gopher tortoise, gulf sturgeon, green sea turtle, least tern, loggerhead sea turtle, Louisiana quillwort, manatee, Mississippi gopher frog, Mississippi sandhill crane, piping plover, red-cockaded woodpecker, and saltmarsh topminnow (Mississippi Department of Wildlife, Fisheries, and Parks, letter dated June 22, 2000, USFWS Endangered Species web site, July 19, 2000). Direct impacts on habitats for these species and indirect impacts through fragmentation or encroachment will be evaluated in the trends analysis. The analysis will be qualitative by necessity because the occurrences of these species are often very localized and impacts are dependent on site-specific conditions.

- *Study Area:* Coastal study area as defined in Section 2; however, for certain species it may be necessary to expand the study area.

- *Analytical Approach:*

  - Determine locations of viable habitat and designated critical habitat. This information will be obtained from the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and state agencies.

  - Analyze historical and projected impacts viable/critical habitat (including water resource impacts, wetlands losses, reduction in functional value of wetlands, and terrestrial habitat impacts [loss, fragmentation, encroachment]) used by federally listed species. Evaluate historical/anecdotal impacts on TES based on site-specific studies conducted in the study area. Use available studies and habitat impact analyses to qualitatively assess impacts on TES. Qualitatively evaluate the benefit of implementing RCPs to protect listed species in the study area.

4.7 AIR QUALITY

- *Issues:* Regional trends in ozone precursor emissions (precursor pollutants: volatile organic compounds [VOCs] and nitrogen oxides [NO_x]); ozone dispersion and transport; stationary (point) source, area source, and mobile source emissions; localized carbon monoxide problems; stationary source sulfur dioxide emissions (SO_2); Notices of Violations (NOVs), and hazardous air pollutants (HAPS)

- *Scope of the Analysis:* The focus of the analysis will be primary sources of air emissions from mobile sources (motorized vehicles, aircraft, marine craft, and ships) and point sources (power plants, manufacturing plants, boilers, landfills, incinerators, wastewater treatment plants, gas stations, and construction/land-clearing activities). The following air quality factors in the study area would be described, as appropriate: ambient air quality conditions, existing air emission sources, air pollution source permits, federal and state air pollution control regulations and standards, criteria for attainment/nonattainment areas, sensitive receptors in the study area, compliance with Federal and State Implementation Plans, and local or regional meteorological conditions, as they relate to pollutant dispersion (e.g., wind speed, wind direction, and mixing height).

  The three-county area (Hancock, Harrison, and Jackson counties) is currently in attainment for all six National Ambient Air Quality Standards (NAAQS) criteria pollutants. Those pollutants are carbon monoxide (CO), lead (Pb), nitrogen oxides (NO_x), ozone (O_3), particulate matter with aerodynamic size less than or equal to 10 micrometers (PM_{10}), and sulfur dioxide (SO_2). Comments received during interagency and public scoping meetings indicated that the state was concerned with the rise of ozone precursors and noted that Hancock and Jackson counties are operating at levels higher than the 8-hour standard. (It should be noted, however, that there currently is not an enforceable 8-hour standard for ozone because of a court action; and the area is in attainment with respect to the former 1-hour standard.) Levels of ozone are normally assessed relative to the production of VOCs and/or NO_x. Of particular concern is the rise of ozone precursors over the last 10 years and the potential increase of mobile emissions that generate those precursors as well from point sources such as refineries, power plants, and paper manufacturers. To this end, the EIS will semi-quantitatively evaluate the relative contribution of mobile sources and the potential benefits of implementing RCPs (e.g., improved traffic management measures) under different future growth scenarios. The trends analysis also will include a semi-quantitative and qualitative analysis of point source emissions under future growth.

- *Study Area:* Air quality typically has a study area much larger in area (e.g., a metropolitan area or regional airshed) than the areas for other resources because of the factors used in measuring effects. Hancock, Harrison, and Jackson counties fall into the Biloxi-Gulfport-Pascagoula metropolitan statistical area (MSA), which falls in the Mobile-Pensacola-Panama City-Southern Mississippi Air Quality Control Region (AQCR). The analysis will focus on the MSA rather than the AQCR.

- Analytical Approach:

  - Review available air studies and monitoring data (e.g., 1999 *Air and Noise Modeling Technical Report* by Baker, Gulf Coast Ozone Study when available, state air quality agency for air monitoring data and historical emissions for MSA, and USEPA's AIRS database). Summarize regional emission trends based on available emission forecasts provided by the state.

  - Use population and traffic trends analysis, as well as trends identified from analyzing air concentrations and emissions, to qualitatively assess future impacts on air quality under growth scenarios evaluated in the EIS. Based on these results, develop RCPs for the protection of air quality (e.g., implementing regional air source study and modeling effort to evaluate and mitigate ozone problems) and qualitatively assess the benefits of implementing these strategies.

4.8 NOISE

- *Issues:* Stationary noise sources (e.g., airfield operations, building construction and demolition); mobile noise sources (e.g., vehicular traffic and aircraft); sensitive receptors; federal, state, and local noise standards; and land use compatibility.

- *Scope of the Analysis:* Cumulative noise impacts resulting from growth are primarily associated with increased roadway traffic and air traffic. Typically noise issues are highly dependent on site-specific conditions. Therefore, the trends analysis will evaluate these impacts qualitatively.

- *Study Area*: Coastal Mississippi study area as defined in Section 2. The decrease in noise levels with increasing distance generally results in a fairly limited impact area. Consequently, the analysis will focus on areas in traffic corridors of the tri-county area.

- *Analytical Approach:*

  - Use existing studies (in particular the 1999 Air and Noise Modeling Technical Report by Baker) and monitoring data to evaluate the spatial and temporal extent of noise impacts from 1992 to the present.

  - Review land use criteria compatibility guidelines and noise overlays (if established for the counties/municipalities) to determine potential noise impacts in transportation corridors.

- Evaluate trends analysis conducted for transportation, which includes an assessment of traffic levels and population growth trends, to assess qualitatively noise impacts for each of the growth scenarios and conservation scenarios evaluated in the EIS. Evaluate the benefit of implementing various RCPs for reducing noise impacts.

4.9 CULTURAL RESOURCES

- *Issues:* Disturbance of known or unidentified potentially significant buried archaeological sites; disturbance of existing or potential significant historic standing structures or districts, including visual impacts; disturbance or destruction of traditional cultural properties; and Native American issues.

- *Scope of the Analysis:* Cultural resources in the project area include prehistoric and historic archaeological sites, and significant historic structures, including Beauvoir, the last home of Jefferson Davis. Archaeological sites can be adversely affected by soil disturbance caused by construction, erosion, artifact looting, and vandalism. Standing structures can be adversely affected by new construction, which can affect the historic feeling of the area surrounding a structure or historic district by creating intrusive noncontributing structures, roads, and so forth.; or by making architectural modifications to existing historic structures.

  Due to the site-specific nature of this analysis and the many unknowns related to archaeological resources (e.g., location), it is not practical to conduct a regional quantitative analysis of impacts to cultural resources. Rather a qualitative analysis will be conducted that evaluates the potential for future impacts based on past conflicts and land cover changes over time.

- *Study Area:* Coastal study area as defined in Section 2, with an emphasis on existing historic neighborhoods and structures; and, for archaeological sites, areas on bluffs and near freshwater sources.

- *Analytical Approach:*

  Prehistoric and Historic Archaeological Sites:

  - Examine available studies on prehistoric and historic archaeological sites within the study area.

  - Examine U.S. Geological Survey (USGS) topographic maps and U.S. Department of Agriculture (USDA) county soil surveys to identify locations in the project area that would have high probability of containing archaeological sites.

  - Coordinate with the state and local groups to evaluate past conflicts and the potential for future impairments to archaeological resources based on past experience and estimated land cover changes.

  - Evaluate the benefits of implementing RCPs for the protection and conservation of archaeological resources.

  Standing Structures and Historic Districts:

  - Identify historic standing structures in the project area. Examine available studies on standing structures and historic districts within the study area.

- ➢ Coordinate with the state and local groups to evaluate past conflicts and the potential for future impairments to historic structures and districts based on past experience and estimated land cover changes.

- ➢ Evaluate the benefits of implementing RCPs for the protection and conservation of historic structures and districts.

Native American Issues:

- ➢ Identify and contact interested Native American groups (e.g., Biloxi-Tunica, and Choctaw) by letter, and coordinate with them regarding potential impacts to prehistoric archaeological sites and Native American traditional cultural properties of which they might be aware.

4.10 LAND USE

- *Issues:* Land use change; conflicts with existing land use plans, policies, and controls; land use incompatibility; urban sprawl; encroachment on agricultural land, particularly prime agricultural land or prime farmlands, and sensitive lands; and land cover change, particularly cover change that leads to an increase in impervious surfaces in watersheds.

- Scope of the Analysis: *The scope of the technical analysis is presented below:*

  - ➢ Land Use Change. Land use change will be noted and evaluated.

  - ➢ Conflicts with Existing Land Use Plans, Policies and Controls. Possible conflicts between the projected land use and the objectives of federal, regional, state, and local land use plans, policies, and controls for the area concerned will be noted, including compliance with the Coastal Zone Management Act as implemented by the State of Mississippi.

  - ➢ Land Use Incompatibility. Although a conflict with existing land use plans, policies, and controls identified above would be considered an incompatible use, so too might an increase in noise levels, light emission levels, odors, or traffic or an increase in the intensity and timing (such as at night) of activities. The potential for land use incompatibilities will be addressed qualitatively, particularly with respect to public nuisances that could adversely affect the health, safety, welfare, comfort, or convenience of the public in general.

  - ➢ Urban Sprawl. Sprawl, defined as "low-density, automobile-dependent development beyond the edge of service and employment areas," is encouraged by certain land use actions, and the potential for its continued evolution will be addressed.

  - ➢ Encroachment on Agricultural Land. The loss of agricultural land, particularly prime farmlands, the potential for "irreversible or irretrievable commitments of resources," and the "relationship between short-term uses of man's environment and the maintenance of long-term productivity" will be evaluated.

  - ➢ Land Cover Change. The relationship between land use and land cover change will be addressed, including an analysis of the driving forces of land cover change, emphasizing how changes in land use influence changes in land cover. Land cover conversion, involving changes from one cover type to another, and land cover transformation, the significant modification within a single cover type or the gradual, long-term change from one cover type to another, will be addressed qualitatively on a watershed basis.

- Changes in impervious cover will be particularly emphasized, because limiting impervious surface, or built-upon area, is increasingly seen as perhaps the most feasible method for local governments to address water pollution. Since non-point source pollutant runoff is site-specific and diffuse in nature, using built-upon area instead of more technical methods has a number of advantages: built-upon area is easily measurable; it can be used to estimate cumulative water resource impacts; and it can be controlled through land use regulation.

- *Study Area:* Coastal study area as defined in Section 2 (unless otherwise noted above).

- *Analytical Approach:* Topics discussed in the *Scope of the Analysis* section above will be addressed qualitatively with consideration of the quantitative trends analysis used to assess land cover type changes over time. The quantitative methods for estimating land cover for each of the growth scenarios were presented in Section 3.

4.11 INFRASTRUCTURE

- *Issues:* Drinking water supply, treatment, and distribution; water supply and distribution for industrial and fire fighting requirements; wastewater discharge (industrial and domestic) collection, treatment, and; septic tanks; storm water collection and discharge; NPDES permits; energy sources (electrical power, natural gas, fuel oil, coal, and steam generation); solid waste generation, collection and landfilling (local and by transport out of the area); resource recovery and recycling; generation and disposal of hazardous and toxic substances; contaminated sites; and communication systems (telephone, wireless, and cable).

- *Scope of the Analysis:* As growth occurs, utility demands increase correspondingly. Response to that demand in terms of providing service and capacity lags behind that increasing demand. In fact, the quality or delivery of that service changes as growth occurs. This is particularly true with respect to those utilities that rely on tax revenues to fund construction for infrastructure. The analysis for infrastructure will look at the relationship between demand and capacity to support that demand. This analysis will be qualitative. It will describe the current environment and offer predictions of future demand based on future growth scenarios. If capacity is currently met, exceedance thresholds will be estimated. The trends analysis also will evaluate various planning recommendations for smart growth and incentive measures as appropriate, such as instituting a proffer system that requires financial commitments from developers to support increased infrastructure requirements generated as a result of their development.

  For utility systems such as water, wastewater and storm water systems, the age, capacity and functionality of the systems will be evaluated to determine the ability of the systems to support current and future requirements. In particular, concerns were raised that there might not be sufficient capacity to support wastewater treatment requirements. The costs and benefits associated with requiring connections to a centralized wastewater treatment system, as opposed to operating independent septic systems, also will be generally assessed. In addition, the section will analyze combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs).

At the public and interagency scoping meetings, concerns were raised about the adequacy of Mississippi's coastal aquifers to continue to support the drinking water demands of the region. The adequacy of the regional aquifers to support drinking water requirements and the availability of alternative sources will be addressed in the trends analysis. Issues concerning infrastructure operation and vulnerability to high winds and flooding, especially for potable water contamination from hurricanes and other tropical storms, will be addressed qualitatively.

Energy utilities and communication systems will likely have to be expanded in the future. Analysis will include the capacity of the existing infrastructure, addressing type, age, operation, and maintenance of the systems. Growth and increased operational tempo would have a corresponding impact on air quality and water quality. Qualitative predictions of future demand will be made, and a qualitative analysis of current capacity and system functionality will be conducted.

Solid waste analysis will include looking at landfill capacity, life expectancy, and operation and maintenance of existing regional landfills and incinerators, as well as evaluating options to expand those landfills versus transporting solid waste outside the region. The analysis will include impacts on soil, surface waters, and groundwater. Estimated quantitative predictions of solid waste generation will be provided based on future growth scenarios. Solid waste collection, transfer, processing, treatment, reuse, and recovery also will be evaluated qualitatively.

Hazardous and toxic substances as well as analysis of current and planned restoration efforts of contaminated sites will be evaluated qualitatively. The analysis will include impacts on soil, surface waters, and groundwater and air quality (effects from incineration), and odors from landfills. Potential impacts from future development will be addressed qualitatively. The analysis will include manufacture, generation, storage, transport, treatment, and disposal of hazardous and toxic substances; underground and aboveground storage tanks (UST/ASTs); low-level radiation; pollution prevention efforts; waste reduction; human health hazard reduction; and toxic substance stabilization.

- *Study Area:* Coastal study area as defined in Section 2.
- *Analytical Approach:*
  - Use existing studies, county and municipal plans, consumption data and plant and system operation and maintenance data to evaluate current capacity and functionality of systems and plant facilities.
  - Interview and receive input and data from regional utility providers, manufacturers, industrial plants, and federal facilities.
  - Estimate future requirements and thresholds using typical utility demand and operational values applied against estimated carrying capacities under various future growth scenarios.

4.12 TRANSPORTATION

- *Issues*: Level-of-service, congestion, safety, roadway construction, emergency evacuation, and emergency response.

- *Scope of the Analysis:* Numerous comments received during the scoping indicated concern that transportation issues—especially traffic congestion and emergency evacuation—were issues of concern. The approach for analysis of transportation impacts will include review and evaluation of current historical trends, studies, plans, and programs that address regional transportation issues. The Mississippi State Transportation Improvement Plan should define future changes to the roadway network. The EIS for the North-South connector and the transportation analysis contained therein should provide information to support the EIS.

  The trends analysis will focus qualitatively on traffic growth, trip distribution, and assignment on a roadway network which will be improved over the next 20 years through capital investments in new roadways and bridges. The underlying assumptions used in developing the existing plans, studies, EIS, etc., would be evaluated against the output from the trends analysis (particularly population projections) to see if those plans adequately anticipated future growth. In addition, this analysis will be coordinated with the Federal Highway Administration (FHWA) and Mississippi Department of Transportation (MSDOT) points of contact.

- *Study Area:* Coastal study area as defined in Section 2, with an emphasis on highways classified as primary arterial and minor arterial by the GCMPO and MSDOT.

- *Analytical Approach:*

  Roadway:

  - Use existing studies (including the ongoing FHWA EIS) to establish existing levels of service on highways and key interchanges and intersections.

  - Estimate future 2020 levels of service on major roadway segments based on submitted traffic impact studies, the FHWA EIS, and approved preliminary concept plans.

  - Determine the roadway stage construction schedule for major highway work and establish the effects on roadway levels of service (qualitatively) between 2000 and 2020. Also relate roadway improvement work for major land development projects.

  - Based on the results of this analysis, it may be determined that existing studies are insufficient to assess overall transportation impacts in the study area to the satisfaction of agency participants and/or the public. In this case, implementation of RCPs will include recommendations for conducting a regional transportation study to evaluate changes in LOS.

  Emergency Evacuation:

  - The limited surface transportation corridors available for emergency evacuation are recognized as an issue for the Mississippi coastal area. Impacts from development, along with existing and planned transportation development projects, will be evaluated qualitatively. Existing evacuation plans, studies, historical case studies, and interviews with civil authorities associated with emergency evacuation will be used to describe the current condition and determine if consideration for growth was factored into planning.

  Public Transportation:

- Development will affect service areas for Coast Transit Authority (CTA) bus routes and will cause a change in ridership. The trend analysis will qualitatively determine the expected change in mode shift to public transportation for both public bus routes and potential shuttle services between major land development plans.

Railroads:

- Both freight and passenger rail pass through the study area. Continuing economic development will increase rail freight. Further expansion of the area's Marine Terminal will increase rail use. The trend analysis will determine the increase of tonnage at the Marine Terminal, that will use rail as determined through interviews with port users. The analysis also will determine the rail freight needs of existing and proposed industrial park sites and will assess the amount of hazardous material that travels by rail. Passenger rail will increase with tourism and greater gaming industry success. Passenger counts, in conjunction with origin-destination studies, will determine the trends in passenger rail ridership.

Marine Transportation:

- The marine facilities are expected to expand over the next 20 years. This expansion will depend on future contracts with shippers, which this analysis will determine through interviews with Port officials and tenants at the Port. The study will establish the existing tonnage at the Port and the historical growth rate. The intermodal transfer of freight from ships to the ground transportation system will be evaluated qualitatively.

Air:

- The tourism and gaming industry will cause air passenger traffic to increase. The Gulfport-Biloxi Regional Airport has aggressive future plans to expand the current facility and to increase the number of carriers using the airport. The trend analysis will determine the existing level of passenger arrivals and departures, capacity, and plans for growth through interviews with airport officials and airlines servicing the airport, along with an evaluation of available planning studies.

4.13 SOCIOECONOMICS

- *Issues:* Pace of economic development; population growth; impacts on availability and affordability of housing; impacts of casino growth on other businesses; indirect economic impacts on surrounding areas; community service capacity; increase in social problems; aesthetics; recreational opportunities; environmental justice; and protection of children.

- *Scope of the Analysis:* Interagency and public hearing participants indicated that rapid economic growth and its direct and indirect impact on the quality of life are major issues along the coast. To support this assessment, it is proposed that a quantitative economic analysis be conducted using economic forecasting modeling to capture the potential impacts of induced economic growth. The results of the modeling effort and historical trends analyses will be used to evaluate the impact on the overall quality of life. Economic impacts will be evaluated quantitatively; social impacts will be evaluated either semi-quantitatively or qualitatively.

- *Study Area:* The study area or region of influence (ROI) will encompass the three counties most affected by recent large-scale development—Harrison, Hancock, and Jackson counties. Depending on availability of funding, the ROI will be divided into two subregions with Hancock and Harrison Counties constituting one region and Jackson County a second region, or all three counties will be aggregated into one region.

- *Analytical Approach:* Projected changes in the population and economy for the ROI will be estimated using the REMI model. The REMI model is a commercially available economic model that is regionalized to reflect economic characteristics (industry makeup, employment, trade flows, income, demographics) of the ROI using detailed economic and demographic data. The level of analysis will depend on the availability of funding; either a 53-sector or a 17-sector version of the model will be employed. The model can be run to estimate the economic impacts of alternative growth scenarios, including impacts to income, employment, output, and population growth.

Population and Economic Development:

- Use historical data and REMI model to project population economic growth over the study period.

- Compare REMI population projections with MSDMR projections to ensure consistency of approach with previous studies.

- Use population projections and economic trends to estimate annual growth in employment and output by industrial sector, personal income, and other economic indicators for each growth scenario.

- Perform sensitivity analysis to determine impacts of different development scenarios on economic development.

Housing:

- Estimate demand for housing in projection years based on population growth for each growth scenario.

Community Services:

- Qualitatively evaluate demand for public services in projection years based on population growth for each growth scenario.

Aesthetics:

- Interviews with local planning officials will help determine and describe the landscape character, existing scenic integrity, inherent scenic attractiveness, and landscape visibility of the study area. The visual absorption capability of the area will be assessed with the input of local planners. Areas worthy of preservation, retention, and partial retention, versus areas where modification of scenic integrity would be acceptable, will be identified with local input.

- The potential for the destruction or degradation of landscape character, scenic attractiveness, and scenic integrity from the proposed action and alternatives will be assessed qualitatively based on the land use and land cover change analysis. Issues evaluated will include destruction, degradation, and alteration of landscape character and scenic attractiveness; reduction in visibility; changes in elements of line, color, form, and texture; light pollution; and auditory intrusion.

Social Problems:

- It is not within the scope of this EIS to conduct a study to assess the relationship between casino gaming activities and potential increases in various social problems in the ROI. For this EIS, the analysis will be limited to evaluating historical trends for readily available statistics on various social problems in the ROI (e.g., per capita rates for certain crimes and social problems), as compared to readily available state and national statistic s. The results of this analysis will be used to qualitatively assess future conditions. The extent to which these trends are related to casino gaming activities or other social issues will not be discernable from the level of analysis being conducted. Alternatively, relevant local or national studies will be cited, as appropriate.

Environmental Justice and Protection of Children:

- Potential environmental justice issues could include adverse impacts on housing affordability, increase crime rates, and disproportionate adverse physical environmental impacts on areas with high minority or low-income populations. Census track data and land cover data, as well as scoping input, will be used to assess the extent of environmental justice or protection of children issues.